#13 C/BM 4-24-03



**Expedited Proceeding Under 37 C.F.R. § 1.116**
Examining Group 1731

**PATENT APPLICATION**
Attorney Docket No. 1835D/A

**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE**

**APPLICANTS:** CIMECIOGLU, A. Levent *et al.*

**SERIAL NO.:** 09/638 319 **GROUP ART UNIT:** 1731

**FILED:** 14 August 2000 **EXAMINER:** FORTUNA, José A.

**ENTITLED:** ALDEHYDE MODIFIED CELLULOSE PULP FOR THE PREPARATION OF HIGH STRENGTH PAPER PRODUCTS

CERTIFICATE of MAILING UNDER 37 C.F.R. § 1.8

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**REPLY UNDER 37 C.F.R. § 1.116**

Dear Sir:

This Reply is in response to the final Office Action dated 26 February 2003. In reply to that outstanding Office Action, Applicant submits the following Amendments and Remarks –

## AMENDMENTS

**Listing of Claims:**

1. (Canceled)

2. (Currently amended) The ~~aldehyde-modified cellulose pulp~~ paper of claim 26 wherein the aldehyde-modified cellulose pulp has from about 5 to about 20 mmoles of aldehyde per 100 g of cellulose.

3. (Currently amended) The ~~aldehyde-modified cellulose pulp~~ paper of Claim 26 having a wet strength to dry strength ratio of at least 20%.

4. (Currently amended) The ~~aldehyde-modified cellulose pulp~~ paper of Claim 26 wherein the paper has an improved compression strength and resistance of greater than about 1% over that of a paper prepared from a corresponding unmodified cellulose pulp.

5. (Currently amended) The ~~aldehyde-modified cellulose pulp~~ paper of Claim 4 wherein the paper has an improved compression strength and resistance of greater than about 5%.

6. (Currently amended) The ~~aldehyde-modified cellulose pulp~~ paper of claim 4 wherein the improved compression strength and resistance is measured under conditions of high humidity.

7. (Currently amended) The ~~aldehyde-modified cellulose pulp~~ paper of Claim 26 wherein the cellulose pulp has a ratio of aldehyde to carboxylic acid functionality of about 0.2 or more.

8. (Canceled)

9. (Canceled)

10. (Canceled)

11. (Canceled)

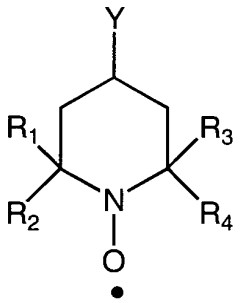
12. (Canceled)

13. (Canceled)

14. (Currently amended) The ~~method~~ paper of Claim ~~28~~ 26 wherein the paper is prepared by oxidizing the cellulose pulp with an oxidant ~~has~~ having an equivalent oxidizing power of from about 0.05 to 5.0 g of active chlorine per 100 g of cellulose.

15. (Currently amended) The ~~method~~ paper of Claim ~~28~~ 14 wherein the oxidant is sodium hypochlorite or sodium hypobromite.

16. (Currently amended) The ~~method~~ paper of Claim ~~28~~ 26 wherein the nitroxyl radical has the formula:




where Y is H, OH or NH-C(O)-$CH_3$; and $R_1$, $R_2$, $R_3$ and $R_4$ represent the same or different alkyl groups of 1 to 18 carbon atoms.

17. (Canceled)

18. (Canceled)

19. (Canceled)

20. (Canceled)

21. (Currently amended) The ~~method~~ paper of Claim 15 wherein the amount of oxidant used is from about 0.1 to 10% by weight of sodium hypochlorite based on the weight of cellulose and from about 0.1 to 5% by weight of sodium bromide based on the weight of cellulose ~~are used~~.

22. (Canceled)

23. (Canceled)

24. (Canceled)

25. (Canceled)

26. (Presently amended) ~~Aldehyde-modified cellulose pulp~~ Paper having improved wet strength, temporary wet strength and dry strength properties prepared by oxidizing cellulosic pulp material in an aqueous solution in the presence of a nitroxyl radical mediator thereby producing aldehyde-modified cellulose pulp, wherein the aldehyde-modified cellulose pulp has from about 1 to about 20 mmoles of aldehyde per 100 g of cellulose.

27. (Canceled)

28. (Canceled)

## REMARKS

Claims 2-7, 10-16, 18-21, 23 and 26-28 are pending in the application. Claims 2-7, 10-16, 18-21, 23 and 26-28 are rejected. Claims 10-13, 18, 19, 20, 23, 27 and 28 have been canceled. Claims 2-7, 14-16, 21 and 26 are amended. No new matter is submitted with these Amendments.

**Reply to the Double-Patenting Rejection of Claims 2-7, 10-16, 18-21, 23 and 26-28**

The Examiner has rejected Claims 2-7, 10-16, 18-21, 23 and 26-28 under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 1-18 of U.S. Patent No. 6,228,126 ("the '126 patent") in view of U.S. Patent No. 5,698,688 to Smith *et al.* ("Smith") or U.S. Patent No. 4,731,162 to Solarek *et al.* ("Solarek"). Specifically, the Examiner states –

> The only difference between the claims of the present application and US Patent No. 6,228,126 B1 is that the present invention explicitly limits the claims as for improvement of the strengths of the pulp. However, both Solarek et al. and Smith et al., teach that modification of cellulose by introducing, oxidation, aldehyde groups in the cellulose increases the strength of the fibers/pulp. Note also that is also taught by U.S. Patent No. 6,228,126 B1 in the specification.

For the following reasons, Applicants respectfully traverse the Examiner's rejection of claims 2-7, 10-16, 18-21, 23 and 26-28 under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 1-18 of the '126 patent in view of Smith or Solarek.

The present application is a continuation-in-part application of the '126 patent, filed 17 August 1999. The '126 patent was originally filed with 37 claims, which were restricted into two groups – Group I drawn to a paper product and method of making paper, and Group II drawn to a method of making aldehyde-modified cellulose or cellulose pulp and the products of that process. Group II was elected and prosecuted to allowance.

The product and method claims of Group I were then filed in the present CIP application, along with additional dependent claims directed towards paper strength features. U.S. Application No. 09/754,176 ("the '176 application") was subsequently filed on 4 January 2001 as a continuation of the '126 patent, and is presently pending issuance. That case was filed with the 37 original claims of the '126 patent. Like its parent, the '176 application was restricted to two

groups, with Group I being elected this time. During the course of its prosecution, the paper product claims of the '176 application were canceled and the method of making paper claims allowed.

With this Reply, the presently pending method of making paper claims have been canceled. The remaining independent paper product claim 26 and its corresponding dependent product claims have been amended to claim paper products having improved strength that are made from aldehyde-modified cellulose pulp. Present independent claim 26 is narrower in scope than (canceled) claim 1 of the present application (which claim 26 replaces).

As shown above, (canceled) claim 1 was the same claim 1 originally filed in the parent '126 patent. Claim 1 was restricted and not elected in the '126 patent. It is that same claim 1 (originally filed in the '126 patent and now replaced by narrower-in-scope claim 26) and its corresponding dependent claims that are presently being prosecuted. Accordingly, the Examiner's obviousness-type double patenting is improper and should be withdrawn. Withdrawal, therefore, of the obviousness-type double patenting rejection of claims 2-7, 10-16, 18-21, 23 and 26-28 is respectfully requested.

**Reply to the Rejection of Claims 2-7, 10-16, 18-21, 23 and 26-28 under 35 U.S.C. § 103(a)**

The Examiner has rejected Claims 2-7, 10-16, 18-21, 23 and 26-28 as being unpatentable over Smith in view of U.S. Patent No. 6,379,494 to Jewell *et al.* ("Jewell") or U.S. Patent No. 6,331,619 to Besemer *et al.* ("Besemer"). Specifically, the Examiner states –

> Regarding Claims 26-28, 2, 9, 16, 18-21 and 23, Smith et al. teach a paper made with aldehyde modified fibers, see abstract. Smith et al. teach also that the aldehyde groups increase the temporary strength of the fibers, see abstract. Even though Smith et al. are silent with respect to the number of moles of aldehydes in the fibers, Smith et al. teach that the presence of aldehyde groups is evidenced by an increase of wet strength of the paper formed from the modified fibers and that the degree of oxidation can be readily optimized for a given fiber weight to obtain desired degree of aldehyde groups in the fibers and that it would be desirable to avoid over oxidation so to control the formation of carboxylic acids groups in the fibers, see column 7, lines 8-20. Therefore, it is clear that optimizing the degree of aldehyde to the claimed degree would have bee obvious to one of ordinary skill in the art, in order to optimize the strength of the fibers. Smith et al. do not teach the use of nitroxyl compounds for the formation of aldehyde in the cellulose. However, both Jewell et al. and Besemer et al. teach that cellulose can be efficiently oxidated by the use of compounds having nitroxyl groups, such as

> TEMPO and derivatives, see abstract. The advantages of using TEMPO or derivatives over the other oxidants are: a) a more controlled oxidation is obtained, i.e., the oxidation can be affected in the primary carbons of the cellulose, see Jewell et al., column 4, lines 26-51; b) the amount of oxidant, TEMPO, is low, because TEMPO is not irreversible consumed and can be regenerated by a secondary, see Jewell et al., column 4, lines 36-47; c) more efficient oxidation is obtained with less degradation of the cellulose, see Besemer et al. column 3, lines 26-61 Note that Jewell et al. teaches that the oxidation with TEMPO produces also aldehydes, see column 4, lines 57-61. Therefore, using nitroxyl compounds as taught by Jewell et al. and Besemer et al. to obtain the aldehydes groups in Smith et al. invention would have been obvious to one of ordinary skill in the art in order to obtain the advantages indicated above.
>
> Regarding Claims 3-7, and 10-15, Smith et al. show in column 11, lines 3-24, paper having ratio of wet to dry strength greater than 20%. The paper inherently has compressible strength and resistance improvement over 5% as compared with corresponding unmodified pulp, since they have the same amount of aldehyde groups in the fibers. Regarding claim 15, Smith et al. teach also that any catalyst can be used in the reaction, see column 5, lines 59-62, and therefore the use of the claimed catalyst would have been obvious to one of ordinary skill in the art since they are well known in the art and it has been held that "[W]here two equivalents are interchangeable for their desired function, substitution would have been obvious and thus, express suggestion of desirability of the substitution of one for the other is unnecessary." *In re Fout* 675 F.2d 297, 213 USPQ 532 (CCPA 1982); *In re Siebentritt*, 372 F.2d 566, 152, USPQ 618 (CCPA 1967).

For the following reasons, Applicants respectfully traverse the Examiner's rejection of claims 2-7, 10-16, 18-21, 23 and 26-28 as being unpatentable over Smith in view of Jewell or Besemer.

Smith was discussed in Applicants' Reply of 29 January 2003, those arguments being incorporated herein. As previously shown, Smith teaches a two-step process for forming aldehyde-modified cellulosic fibers. This process involves (1) esterifying cellulosic fibers with a 1,2-disubstituted alkene having at least one carboxylic acid group reactive with cellulosic hydroxyl groups, and then (2) oxidizing the esterified fibers to form aldehyde groups (Abstract; col. 2, lines 41-50; col. 3, lines 14-16). Smith defines "1,2-disubstitute" to mean that each of the doubly bonded carbons is singly bonded to one carbon atom other than the doubly bonded carbon atom and to a hydrogen atom (-HC=CH-) (col. 3, lines 24-27).

Smith describes *intermediate cellulosic fiber* compositions made by esterifying cellulose with an olefin (*i.e.*, double bond contained within an aliphatic ring) containing carboxylic acid or acid derivative (acid amide) (*see*, col. 3, lines 14-23). This is step (1) of the two-step Smith process.

Once esterified, this intermediate cellulosic fiber is then oxidized to form the modified cellulosic fibers of Smith (col. 6, 19-21; see the resultant modified cellulosic fiber structure illustrated in column 7 of Smith). "Oxidation is accomplished by contacting the intermediate cellulosic fibers with an oxidizing agent under conditions to cause the formation of aldehyde groups on the residue of the carboxylic alkene" (col. 6, lines 26-29). This is step (2) of the two-step Smith process. Oxidizing agents include ozone and potassium, with ozone being preferred (col. 6, lines 49-50).

Using the invention of Smith, the amount of acid/aldehyde that can be introduced to the fiber is controlled by the degree of derivatization with (or, esterification of) the olefin containing carboxylic acid. Accordingly, Smith teaches oxidizing the alkene groups substituted on the fiber (see the structure illustrated in column 6 of Smith), *i.e.*, oxidizing the double bond of the olefin to an aldehyde (col. 6, lines 28-29 and 32-34).

In contrast to Smith, the present invention teaches aldehyde-modified cellulose pulp that is prepared by oxidation of a hydroxyl group to an aldehyde in the presence of a nitroxyl radical mediator. This is an entirely different process than that of Smith, resulting in a completely different product. (In Smith, the aldehyde and carboxyl functional groups are created on a derivative. In the present invention, the aldehyde and carboxyl functional groups are created directly on the cellulose.) Simply because double bond oxidation may produce an aldehyde or that aldehyde content may be controlled thereby does not suggest to one skilled in the art that oxidation via an entirely different process will produce the same result.

As the aldehyde-modified cellulosic fibers of Smith are different from those fibers of the present invention, no optimization exercise based on the disclosure of Smith will enable one of ordinary skill in the art to obtain the aldehyde-modified compositions of the present invention. Further, no such optimization exercise will allow one of ordinary skill in the art to anticipate the high strength properties of the present invention.

Referring to Besemer, therein is disclosed a superabsorbent polysaccharide derivative and its method of production. The polysaccharide derivative is obtained by oxidizing a carboxyl group of the polysaccharide, and subsequently slightly crosslinking the oxidized polysaccharide (col. 1, lines 58-65; col. 2, lines 41-42; col. 3, lines 62-63). Besemer provides a profusion of suitable oxidation techniques (col. 2, line 41 – col. 3, line 28), including the oxidation of starch

and other polysaccharides using hypochlorite in the presence of TEMPO (col. 3, lines 33-37). Besemer is directed towards the modification of polysaccharides, and provides no mention of cellulose pulp, even more its modification. Further, Besemer is directed towards improve absorbency, which is a different property than strength. Accordingly, Besemer adds nothing to Smith and one skilled in the art would not look towards Besemer for improving strength. Additionally, even if one skilled in the art were to combine Smith and Besemer, the result would still be directed towards the creation of aldehyde and carboxyl functional groups on a derivative, and not aldehyde-modified cellulose pulp. Therefore, Smith and Besemer, alone or in combination, still do not teach or suggest the presently claimed invention.

Referring to Jewell, therein is disclosed a method of making carboxylated cellulose fibers and its associated products. In an aqueous slurry, cellulose fibers are oxidized with TEMPO and a secondary oxidant such as a water soluble hypohalite compound (col. 4, lines 26-51). After oxidation, the cellulose is washed and reslurried and subjected to a stabilizing compound to convert substituent groups such as aldehydes and ketones to hydroxyl or carboxyl groups (col. 4, lines 57-61). According to Jewell, unstabilized TEMPO oxidized pulps, *i.e.*, those containing aldehyde substituents, have objectionable color reversion and will self-crosslink upon drying, thereby reducing their ability to redisperse and form strong bonds in sheeted products (col. 4, lines 62-65; *see also*, col. 8, lines 21-32). Because Jewell finds aldehyde-modified cellulose undesirable and therefore seeks to eliminate such substituents on the pulp, Jewell teaches away from the present invention. Likewise, Jewell provides no teaching or suggestion that such aldehyde substituents would provide improved paper strength, but rather teaches that they do not improve paper strength (col. 4, lines 62-65). Accordingly, Smith and Jewell, alone or in combination, do not teach or suggest the present invention. Further, because Smith is directed towards aldehyde-modified derivatives, one skilled in the art would not look towards Jewell and its use of TEMPO in the formation of carboxylated cellulose fibers to arrive at the aldehyde-modified cellulose fibers of the present invention.

Further, as shown above in the obviousness-type rejection arguments, the claim of the present application was first filed on 17 August 1999 in the parent '126 patent, which precedes the 15 October 1999 filing date of Jewell. Accordingly, Jewell cannot constitute prior art over the presently claimed invention.

It is believed that these remarks overcome the Examiner's rejection of claims 2-7, 10-16, 18-21, 23 and 26-28 under 35 U.S.C. § 103(a) as being unpatentable over Smith in view of Jewell or Besemer. Withdrawal of the rejection is respectfully requested.

**Reply to the Rejection of Claims 2-7, 10-16, 18-21, 23 and 26-28 under 35 U.S.C. § 103(a)**

The Examiner has rejected Claims 2-7, 10-16, 18-21, 23 and 26-28 as being unpatentable over U.S. Patent No. 5,698,688 to Smith *et al.* ("Smith") in view of the Tetrahedron article by Arjan E. J. de Nooy *et al.* (Tetrahedron, *Selective Oxidation of Primary Alcohols Mediated by Nitroxyl Radical in Aqueous Solution. Kinetics and Mechanism.*, Vol. 51, No. 29, pp. 8023-8032 (1995)) ("de Nooy"). Specifically, the Examiner states –

> Smith et al. invention has been previously discussed, see above. Smith et al. fail to teach the use of nitroxyl radicals as claimed. However, Nooy et al. teach that primary and secondary alcohols, such as the one in cellulose can be oxidized to aldehyde and/or carboxylate depending on the reactions conditions and the substrate, see page 8023 and teach in page 8027 that using inorganic solvents without water or with low concentration of water the reaction stops at the aldehyde stage. Therefore, the use of nitroxyl Radical containing compounds, such as TEMPO, to form aldehyde modified fibers such as the ones disclosed by Smith et al. would have been obvious to one of ordinary skill in the art, since one of ordinary skill in the art would have reasonable expectation of success if Nitroxyl Radical containing compounds are used. One of ordinary skill in the art would find that increasing the aldehyde content of fibers using Nitroxyl Radical is another viable alternative, in view of Nooy et al. teachings.

With respect to Applicants' arguments that the combination of references is improper because de Nooy teaches the oxidation in an organic solvent and one skilled in the art would not expect Applicants' oxidation, which does not require the presence of an organic solvent, to produce aldehyde fibers, the Examiner states that "there is nothing in the claims that limits the formation of aldehyde in fibers in water or non-organic solvent."

For the following reasons, Applicants respectfully traverse the Examiner's rejection of claims 2-7, 10-16, 18-21, 23 and 26-28 as being unpatentable over Smith in view of de Nooy.

Smith and de Nooy were discussed in Applicants' Reply of 29 January 2003, those arguments being incorporated herein. Further, independent claim 26 has been amended to limit the formation of aldehyde in an aqueous media. It is believed that this amendment overcomes the Examiner's rejection of claims 2-7, 10-16, 18-21, 23 and 26-28 as being unpatentable over

Smith in view of de Nooy as neither reference teach or suggest such a limitation as shown in Applicants' 29 January 2003 Reply.

It is believed that these remarks overcome the Examiner's rejection of claims 2-7, 10-16, 18-21, 23 and 26-28 as being unpatentable over Smith in view of de Nooy under 35 U.S.C. § 103(a). Withdrawal of the rejection is respectfully requested.

It is believed that the above amendments and remarks overcome the Examiner's rejections of the claims under the judicially created doctrine of double patenting and 35 U.S.C. § 103(a) as indicated herein above. Withdrawal of those rejections is therefore respectfully requested. Allowance of the claims is believed to be in order, and such allowance is respectfully requested.

Dated: 11 April 2003

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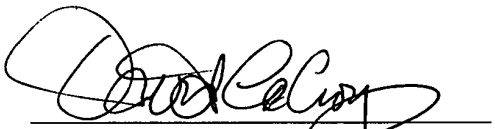

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| | Group Art Unit | 1731 |
| | Examiner Name | Fortuna, Jose A. |
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